Columbus State Community College
Mathematics Department

Course and Number: MATH 1146 – College Algebra Plus

CREDITS: 5 **CLASS HOURS PER WEEK:** 6

PREREQUISITES: MATH 1050 with a "C" or better, or MATH 1099 (MATH 1050 Module) or by placement.

COURSE DESCRIPTION: College Algebra Plus is a course in the study of the elementary functions. The concept of function is developed from definition and notation through an analysis of the elementary functions: linear, quadratic, absolute value, reciprocal, square root, polynomial, rational, exponential, and logarithmic, as well as piecewise, composite, and inverse functions. The analysis includes function behavior with an introduction to the concepts of continuity and limits, extrema, and zeros, as well as corresponding graphical characteristics. The topic of average rate of change of a function is included. Analytic techniques include the Rational Zeros Theorem, Intermediate Value Theorem, and Conjugate Pairs Theorem, as well as factoring and transformations. The course includes solving systems of non-linear equations and partial fraction decomposition and concludes with an introduction to arithmetic and geometric sequences and partial sums. This course is designed to support and strengthen algebraic proficiency within the study of the elementary functions and emphasizes the conceptual framework of the elementary functions and the quantitative reasoning to apply them. This course meets the TMM001 ODHE guidelines for College Algebra.

INSTITUTIONAL LEARNING GOALS: This course addresses the following Columbus State learning goals:

- Critical Thinking
- Quantitative Skills

INSTRUCTIONAL METHODS:

Instructional methods may include face-to-face or video lectures or demonstration, face-to-face or virtual discussion, individual or group activities including the use of visual aids, graphing calculators, computers and/or other technologies. Students may be expected to participate in these activities during class and/or outside of class. Instructors may require class participation, collaborative learning, and peer review.

SPECIAL COURSE REQUIREMENTS: None

TEXTBOOK, MANUALS, REFERENCES, AND OTHER REQUIRED MATERIALS:

Student Authored Resource (Accompanies lecture videos)
ALEKS access & computer and internet access outside of class
3-Ring Binder
8 Tabbed Dividers

STANDARDS AND METHODS FOR EVALUATION:
This course may include a variety of assessment methods including, but not limited or restricted to: exercises, labs, quizzes, tests, projects as deemed necessary and appropriate by the sequence committee to meet the student learning outcomes.

SCALE:

Letter grades for the course will be awarded using the following scale:

≥ 90% - A 80-89% - B 70-79% - C 60-69% - D < 60% - E

Course grades are NOT to be curved, skewed, or otherwise inflated.

Grades will be determined as follows:

Final Exam: 25%
Tests: 43%
In-class Quizzes 5%
Proctored Knowledge Check 5%
Homework: 12%
In class Activities: 5%
Video Lecture Quizzes 5 %

ATTENDANCE/PARTICIPATION POLICY:

Students will earn a grade of Participating (P) or Non-Participating (NP) every day in class. To earn a grade of Participating, the following requirements must be met:

- Arrive on time
- Watch all the assigned lecture videos, complete the video quiz questions, complete the guided notes and have them in class
- Remain until the teacher dismisses the class

Students who fail to meet any of these requirements will be marked as Non-Participating for the day. If a student earns more than the allowed number of NP grades their course grade will be lowered 10%.

ASSESSMENT: Columbus State Community College is committed to assessment (measurement) of student achievement of academic outcomes. This process addresses the issues of what you need to learn in your program of study and if you are learning what you need to learn. The assessment program at Columbus State has four specific and interrelated purposes: (1) to improve student academic achievements; (2) to improve teaching strategies; (3) to document successes and identify opportunities for program improvement; (4) to provide evidence for institutional effectiveness. In class you are assessed and graded on your achievement of the outcomes for this course. You may also be required to participate in broader assessment activities.

STUDENT CODE OF CONDUCT: As an enrolled student at Columbus State Community College, you have agreed to abide by the Student Code of Conduct as outlined in the Student Handbook. You should familiarize yourself with the student code. The Columbus State Community College expects you to exhibit high standards of academic integrity, respect and responsibility. Any confirmed incidence of misconduct, including plagiarism and other forms of cheating, will be treated seriously and in accordance with College Policy and Procedure 7-10.

COLLEGE SYLLABUS STATEMENTS
Columbus State Community College required College Syllabus Statements on College Policies and Student Support Services can be found at www.cscc.edu/syllabus or on the College website Quick Links " Syllabus Statements

UNITS OF INSTRUCTION
Please provide a weekly course schedule indicating the Units of Instruction, learning objectives/goals, assigned readings, assignments, and exams.

Unit 1
- Unit of Instruction: Functions: Graphs and Analysis
- Student Learning Outcomes: Upon completion of this unit the student will be able to…

- Determine the symmetry of various functions.
- Upon graphing functions, determine the domain and range; the intercepts; the intervals on which they increase, decrease, or are a constant; the intervals on which they are positive or negative; and the extrema.
- Determine if a function is odd, even, or neither.
- Develop a "library" of basic functions and their graphs.
- Determine the average rate of change of a polynomial function
- Find the difference quotient for elementary functions
- Sketch piecewise functions.
- Analyze piecewise functions.
- Define the absolute value function as a piecewise function.
- List the transformations, in a correct order, to be performed on a parent function to change it to a given function.
- Use geometric transformations to graph functions.
- Use geometric transformations to help in the analysis of various functions.

Unit 2

- Unit of Instruction: Mathematical Models
- Student Learning Outcomes: Upon completion of this unit the student will be able to…

- Build functions as mathematical models to solve applications.

Unit 3
- Unit of Instruction: Power, Polynomial, and Rational Functions
- Student Learning Outcomes: Upon completion of this unit the student will be able to…

- Sketch the graphs of power functions and polynomials, locating the intercepts and extrema.
- Perform a complete analysis of power and polynomial functions.
- Relate roots, factors, and intercepts, along with discussion of multiplicity.
- Perform synthetic division of polynomials.
- Find all the zeros of a polynomial by using synthetic division, the Factor, Remainder, Rational Zeros, and Complex Conjugates theorems.
- Approximate the real zeros of a polynomial using the Intermediate Value Theorem and a graphing utility.
- Express a polynomial in completely factored form.
- Find all zeros of a polynomial (identifying them as rational, real, or non-real)
- Use transformations to graph rational functions.
- Determine the equations for vertical, horizontal, and oblique asymptotes for rational functions.
- Locate holes in the graphs of rational function.
- Sketch accurate graphs of rational functions by hand and confirm the sketch with the graphing calculator.
- Perform complete analyses of rational functions.
- Solve applications of rational functions.
- Solve polynomial and rational inequalities using a sign chart.
- Solve polynomial and rational inequalities graphically.

Unit 4
- Unit of Instruction: Function Operations
- Student Learning Outcomes: Upon completion of this unit the student will be able to…

- Perform algebraic operations on functions.
- Form compositions of functions.
- Decompose a function into non-trivial component functions.

- Determine if a function is one-to-one.
- Verify inverse relations (algebraically and graphically).
- Determine inverses of functions.

Unit 5

- Unit of Instruction: Exponential and Logarithmic Functions

- Student Learning Outcomes: Upon completion of this unit the student will be able to…

- Analyze the exponential function in order to identify its domain, range, zeros, and asymptotes.
- Sketch the graphs of exponential functions by hand and verify using the graphing calculator.
- Solve simple exponential equations.
- Use the exponential function as a model for real life applications.
- Analyze the logarithmic function in order to identify its domain, range, zeros, and asymptotes.
- Sketch the graph of logarithmic functions by hand and verify using the graphing calculator.
- Convert exponential expressions into logarithmic expressions and vice versa.
- Explain the inverse relationship between logarithmic functions and exponential functions.
- Use the logarithmic function as a model for applications.
- Use properties of logarithms to simplify logarithmic expressions.
- Solve exponential equations algebraically and graphically.
- Solve logarithmic equations algebraically and graphically.
- Solve applications involving compound interest.
- Solve applications of exponential growth or decay.
- Solve applications involving Newton's Law of Cooling (optional topic).

Unit 6

- Unit of Instruction: Systems of Equations and Partial Fraction Decomposition

- Student Learning Outcomes: Upon completion of this unit the student will be able to…

- Solve 3x3 linear systems algebraically.
- Solve applications of 3X3 linear systems.
- Solve 2x2 systems of non-linear equations algebraically and graphically
- Solve applications of 2X2non-linear systems.
- Write a rational expression as the sum of partial fractions

Unit 7

- Unit of Instruction: Sequences

- Student Learning Outcomes: Upon completion of this unit the student will be able to…

- Determine whether a sequence is arithmetic.
- Find the nth term of an arithmetic sequence.
- Use sigma notation to express a partial sum.
- Find the sum of the first n terms of an arithmetic sequence.
- Determine whether a sequence is geometric.
- Find the nth term of a geometric sequence.
- Find the sum of the first n terms of an arithmetic sequence.
- Determine whether a geometric series converges or diverges.